

Notice of Allowability

Application No.

10/713,762

Examiner

Thanhha Pham

Applicant(s)

CHENG, YANG CHIN

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 3/14/2007.
2. ☒ The allowed claim(s) is/are 1,2,8-12,17-19,21-24 and 27-29.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

THANHHA S. PHAM
PRIMARY EXAMINER

3/22/07

DETAILED ACTION

This Office Action is in response to Applicant's Amendment dated 3/14/2007.

Allowable Subject Matter

1. Claims 1-2, 8-12, 17-19, 21-24, 27-29 are allowed.
2. The following is an examiner's statement of reasons for allowance:
 - ▶ Recorded Prior Art fails to disclose or suggest the combination of the process steps for forming a semiconductor device as recited in the base claim 1 comprising: performing an ultraviolet radiation exposure to reduce a cross-linked polymer state of the separate photoresist structures; forming a protectant layer over the separate photoresist structures using a diffusion syllilation process; removing a portion of the protectant layer to expose an underlying portion of the photoresist layer; removing the photoresist layer to form at least part of the protectant layer into separate protectant structures having second distances between corresponding points of the separate protectant structures defining a second pitch, the second pitch being less than the first pitch; and removing a portion of the material layer using the separate protectant structures as a mask.
 - ▶ Recorded Prior Art fails to disclose or suggest the combination of the process steps as recited in the base claim 17 comprising: performing a treatment on the second layer to form at least part of the second layer into separate structures having first distances between corresponding points of the separate structure defining a first pitch,

reducing a cross-linked polymer state of the separate structures using ultraviolet radiation, and performing silylation to form a protection layer over the separate structures; removing a first portion of the protection layer to expose the separate structures; removing the separate structures to form at least part of the protection layer into separate protection structure having second distances between corresponding points of the separate protection structures defining a second pitch less than the first pitch; and using the separate protection structures as an etch mask, removing an exposed portion of the first layer.

► Recorded Prior Art fails to disclose or suggest the combination of the process steps for forming a semiconductor device having a reduced pitch as recited in the base claim 27 comprising: exposing the patterned photoresist layer to ultraviolet radiation to alter at least one property of the patterned photoresist layer so that a cross-link degree of a portion of the patterned photoresist layer is reduced; silylating the patterned photoresist layer in a gas phase or a liquid phase by diffusing silylamine into the patterned photoresist layer and forming a silylated layer over the surface; removing a first portion of the silylated layer to expose the patterned photoresist layer using an etching back process or a chemical mechanical planarization process; removing the patterned photoresist layer using a plasma gas to form at least part of the silylated layer into separate silylated structures having second distances between corresponding points of the separate silylated structures defining a second pitch, the second pitch being less than the first pitch; and using the separate silylated structures as an etch mask, removing an exposed portion of the material layer.

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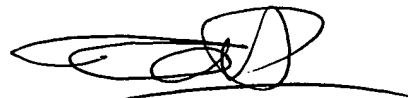
3. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanhha Pham whose telephone number is (571) 272-1696. The examiner can normally be reached on Monday and Thursday 9:00AM - 9:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-272-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TSP



THANHHA S. PHAM
PRIMARY EXAMINER